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An in-depth look at the Covid-19 effects on saving in the largest euro-area countries

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ABSTRACT

Two years have passed since the beginning of the pandemic caused by the Covid-19 virus, and it finally seems like a path to normality is starting to be seen, although that still is a quite quick recovery time when you take into account that this was a situation nobody anticipated. While the virus itself could not affect the economies, the necessary measures to stop its spread brought huge consequences to the entire planet, especially in the health sector but also in the political and economic spheres.

This project will delve into the effects that said pandemic has had in the saving of European households. Specifically, we compare the case in Spain to the one in other European countries like Germany, France, Italy and Sweden in order to shine a light into how the consumers have responded in terms of their financial planning, as well as getting a general comparison of how significant the shock of the Covid-19 epidemic has been.

Keywords: saving, income, pandemic, cycle, forecasting

JEL codes: D14, E21, E23, E27, C53

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1.INTRODUCTION

It’s been two years since the beginning of the Covid-19 pandemic and the instauration of nation-wide states of alarm across many countries in Europe and in the rest of the world.

These measures would mean the isolation of most of the population as well as a heavy regulation of various establishments and open spaces, changing our lives and making us adapt to new conditions we hadn’t experienced before. Such conditions took an obvious toll in businesses, the population, and the economy as the same measures made to prevent the further spread of the virus meant that big social gatherings could not be performed.

The main objective of this paper is to document and reflect on the financial consequences that the Covid-19 pandemic has had in the saving behavior of various European countries, how this behavior has evolved along the stages of the pandemic and perform some empirical studies of our own to try and learn more about the impact of the pandemic on the financial planning of households.

This paper is divided in two main parts. First, we review the literature: we evaluate previous findings on saving theory as well as concepts that we will tackle in our later empirical analysis. In addition to this, we also review several authors whose work has impacted ours and is relevant when it comes to what we will be studying. Furthermore, we also provide a chronology of the pandemic in order to understand what happened and where we are. Secondly, we will perform some empirical analysis so as to further develop some of the concepts we saw in the previous section.

One of the most important points we have come up with in terms of collective conclusions is the fact that most of the papers we studied in one way or another end up sharing a lot of thoughts between them. First and foremost, one of the most important observations that most researchers seem to have agreed on is the fact that the increase in saving, and by consequence the decrease in consumption has been forced in a non-natural way.

That means that the increase in the saving rates comes from mainly the measures imposed by the various governments in the effort to mitigate the harmful health effects of the virus, which meant essentially a period of low to non-existent human relationships in the streets to try and stop the spread of the virus, which in turn brought a period of decreased consumption especially on services that depend on people coming together.

This forced change in the consumer's usual activity meant a large part of the disposable income they had available for these products and services was now being saved due to the uncertainty that the pandemic brought to society.

The other big factor that also took part in the massive increase in savings was the labor uncertainty that the pandemic brought, with reduced numbers of consumption and with the difficulties certain jobs had adapting to this new environment it was to be expected that many workers could end up severely impacted from this and even lose their jobs.

Luckily, many of these negative effects on consumer's well-being were partially mitigated thanks to the quick and effective measures of economic policy that were approved by the governments. This will all be further developed below.

From our results we can confirm some findings that we see in our literature as well as draw some conclusions ourselves. For most countries, saving follows generally a countercyclical relation with the country's GDP, especially seen during the various recessions that our data has recorded as well as having an overall long cycle duration; saving also proves itself to be extremely volatile when compared again to GDP.

Our forecasting results show that for most countries the predicted values for the period that was encompassed in the Covid-19 epidemic were much lower than what actually ended up happening, the majority of countries show a heavy difference between predicted and actual values. However, we also find interesting and unexpected results in our investigative process.

2.LITERATURE REVIEW

2.1. Summary

In this section, we will be reviewing some of the pieces of literature that have helped the most in shaping this project and that we found the most important and interesting. Our literature mainly reflects the previous findings over consumption and saving theory and the behavior of private saving decisions which are a key component in our study for understanding the shocks to an economy and its effects, as well as including data that was recollected over the pandemic to understand its impact over time.

Many theories tackle the various saving puzzles and theories from different angles and perspectives although in the paper by Francesco Grigoli, Alexander Herman, and Klaus Schmidt-Hebbel (2017) they explain how the starting point for most of the modern research on consumption and saving comes from two dominant models, those being the permanent-income hypothesis and the life-cycle hypothesis. The first one makes the assumption that consumers are all homogenous and will all spend money at a level consistent with their expected long-term average income. This, however, contradicts the already observed consumer heterogeneity among several variables like age, income, access to borrowing, etc.

As for the second model, it introduces some of these previously mentioned variables into the equation, mainly consumer heterogeneity related to age and the fact that the consumer seeks to maintain a similar level of consumption throughout their lifetime thus wanting to smooth their consumption curve by taking on debt, saving, etc. The life-cycle hypothesis, while an improvement in some parts, is still missing some aspects and still shows contradictions with the observed evidence, which are hard to explain and can maybe come from the omission of other variables and determinants as well as the always present uncertainty (Grigoli, Herman and Schmidt-Hebbel, 2017).

Continuing from this, the intertemporal optimization for the consumption-saving decision is a puzzle that we have seen multiple times throughout our economics classes, and it is one of the most important pieces of macroeconomic theory when it comes to our investigation. The basics of the problem consist in how much a consumer is willing to give up in current consumption in order to consume more in the future. This is done by saving in the present and it becomes an intertemporal dynamic problem when paired with a second decision at some other point in the future.

In order to understand the puzzle, we need to understand the consumer's budget constraint. According to the parameters, there can be two types of consumers, lenders, and borrowers. Lenders will have more than enough consumption in the current period and can then save or “lend” for the future. Borrowers are the opposite, needing to take from the capital markets in order to fulfil their current consumption needs.

These decisions will depend on several factors like changes in the real interest rate (making saving or depositing for the future more appealing or not), temporary or permanent variations of income or tax (increases in current income would make it so there is more consumption in both periods) and current and future tax variation. For this last concept we also run into another important piece of theory which is that of Ricardian Equivalence.

To put it simply, it assumes that when governments raise money either through taxes or bonds, since those must be repaid (presumably by a tax increase in the future), governments must choose if they tax now or tax later. The consumers interpret this and assume that they will have to pay higher taxes in the future, so that they would put aside savings to pay said future tax increase, which in the end means that the effect on aggregate demand would be the same as if the government had chosen to tax now.

Grigoli, Herman and Schmidt-Hebbel (2017), underline how many other previous studies sometimes present conclusions that contradict previous theories, so called puzzles. For example, Tullio Jappelli and Marco Pagano (1998), in their study over the determinants of the saving rate in Italy, in one instance reach the conclusion that, according to the life-cycle model, the changes in the age structure should have reduced savings. However, they report that in Italy the elderly save at a rate that is a lot higher than predicted by the life-cycle model (Cannari,1994, cited in Jappelli and Pagano, 1998). For that, Grigoli, Herman and Schmidt-Hebbel (2017) try to take into account previous relevant empirical theories and literature and expand on them by addressing their limitations and contradictions.

They confirm some of the findings that previous authors had already found, like that private saving rates are persistent and depend positively on income levels and income growth rates. They also find that inflation increases private saving, maybe because of precautionary reasons. This is something that relates to our study: not just inflation but generally, a moment of macroeconomic uncertainty like a crisis, a war or a pandemic would cause consumers to increase private precautionary saving.

When applying their model to the time period of the 2008 financial crisis, they find that the degree of persistence of the private saving rate fell significantly, while also displaying a short decline in consumption and saving inertia as well as a higher sensitivity to the changes in saving determinants (Grigoli, Herman and Schmidt-Hebbel, 2017, p.10).

Then we also take a look to the results obtained from applying the model to a selected group of advanced economy countries (since our study will be focusing on some of the largest euro area countries). They find that the advanced economies are the ones that show a higher sensitivity of private saving to growth than in the rest of the world.

In the end, the authors reach various conclusions on the theory and literature puzzles. From their review of the data, they determine that while most studies include a core set of potential saving determinants, these tend to not be enough, which means their inclusion of non-standard variables (like temporary or permanent components of income flows, income distribution pension-system variables, etc.) is necessary (Grigoli, Herman and Schmidt-Hebbel, 2017).

Another important theoretical concept that we will tackle in our empirical analysis is that of the business cycle: A cycle consists of the periods of expansion followed by periods of recession that end up leading to the next period of expansion in the following cycle.

In the paper by Yvonne Adema and Lorenzo Pozzi (2015), in a similar approach but with a focus instead on the Great Recession, they set to determine what cyclical behavior the household saving to household disposable income ratio follows in a selected time period (1969-2012) with a focus on the Great Recession that started in 2007.

Similar to our findings in our later analysis, they find that the Great Recession was characterized by an increase of the household saving ratios in many countries, exhibiting a heavy countercyclical behavior. To determine this, Adema and Pozzi (2015) take a panel data approach with 16 developed countries and carry out regressions of the household saving ratio on the logarithm of real GDP as an indicator for the business cycle.

In addition to this, they also add three explanatory variables for unemployment risk, household resources, and credit constraints in order to determine an explanation for the obtained cyclicality of saving rate, and to demonstrate if the household saving ratio is significantly impacted by these explanatory factors, and if they also balance out the ratio's observed cyclicality.

They find that the household saving ratio is countercyclical, on average, for the studied period with this being higher during the recessions. They also find that the proxies for the explanatory variables have a significant impact on the household saving ratio with their combined effect offsetting its countercyclicality (Adema and Pozzi, 2015).

The work done by Gabe de Bondt, Arne Gieseck, Pablo Herrero, Zivile Zekaite (2019) is also helpful to us, because they study private consumption in a cross-country perspective, a scope similar to the one we want to accomplish. As such, it helps us paint a picture of some of the behavior differences between selected countries.

In their investigation, Gabe de Bondt et al. (2019) use a modelling tool that takes into account multiple error correction model specifications instead of a single "best". They find that, in order to better understand the link between consumption and income or wealth, a distinction between the various components of income and wealth is required (that is, we need to include in the model labor, property and transfer income, for example, and financial and non-financial wealth).

In their results they also display several cross-country differences. For example, property income plays a limited role in explaining consumption in France, Italy and Spain, while it is more important to explain German consumption. These differences serve as a reminder to be cautious when interpreting these effects directly from euro area data (Gabe de Bondt et al. 2019, p. 24).

2.2. What happened

In this second section we will be describing a brief timeline of the events that lead to the pandemic, pairing it with macroeconomic data (mainly thanks to the efforts conducted by the Bank of Spain and European Central Bank) so as to paint a picture of the global context that we are dealing with, with a special focus on saving , since this is a relatively recent event the data only goes so far, as it is still a developing situation, which is also why it has been hard to find many studies taking into account the saving rates during the pandemic.

Since the virus was first detected in December of 2019 in Wuhan, China, the fear on everyone's minds was the preparations for when it inevitably got spread, left Asia, and came to our homes, specifically in Europe. That moment came on the 24th of January 2020 in France (NCBI, 2020), where 3 positive cases were detected, after that the virus would only continue to spread and arrive at the other countries. In the case of Spain that day would arrive on the 31st of January to German tourists spending their vacations on the island of "La Gomera" in the Canary Islands (Jesús Arroyo, 2020).

From this and with the passing of the days and the number of cases rising and the first deaths occurring the World Health Organization declares a worldwide pandemic, it would only take Spain 3 days from this announcement to implement the state of emergency on the 14th of March, changing everyone's lives.

When the first wave of the pandemic hit and the first health measures for its containment were applied, the economy resented quickly. During this first quarter GDP in the euro area fell by 15%, one of the largest since the worst previous financial crisis. In the second quarter of 2020, income was partially sustained by the quickly deployed measures we described before, these help measures accounted for 7.5% of household's gross disposable income in the second quarter (Banco de España, 2020). These same transfers are the ones responsible for helping insulate aggregate household income, something that is very different from the previous recessions on the euro area.

The pandemic also affected the job sector, as such the measures also helped cover for employee compensation which had sank by 8% by this time, accompanied by a falling in business activity which is why it was so important to set these actions soon to avoid worse damage. Here we can start to see the differences and the uneven impact of the crisis between the euro countries. While in countries like Germany the impact to real household income was around 1%, in others like Spain and Italy the effects were much worse of 8% and 7% respectively, with these two nations having some of the largest public sector contributions out of the rest of the European countries (Banco de España, 2020).

The actions deployed to counter the effects of the pandemic were extended due to the increasing seriousness of the epidemic which meant their negative effects over the economy would extend even longer throughout the second quarter to mid-year of 2020. These measures caused a 15% fall of household consumption over the euro area. The shock was much more severe in countries like Spain where consumption fell over 23% compared to for example Germany, where it only fell around 12% (Banco de España, 2020).

From the data provided by Ana del Río and José Antonio Cuenca in their report (Banco de España, 2020), we can see the total impact that the Covid-19 had in the overall dip of household consumption on the euro area. Since the pandemic brought a period of macroeconomic uncertainty, the households restructured their spending list of consumption, where the essential goods like food, water, and other non-durable items which are essential for maintenance over a period in where there was no certainty of its duration were the least affected by the drop in consumption.

On the other hand, durable and semi-durable goods were obviously the ones that suffered the most from the drop on consumption experiencing almost a 20% drop in the euro area countries during the second quarter of 2020. This is explained by the fact that consumers were prioritizing the non-durable goods to ensure their survival during the uncertainty periods that they were living at the time. The service sector was also heavily affected, especially the ones that usually involve social interaction, dropping to 20% during that same period, with the prevention measures forcing most people to stay at their home. This was a logical outcome, the consequences of which affected many service providers (Banco de España, 2020).

The biggest example of these policies' effects was the massive drop in spending on vehicle fuel, dropping almost 30% of consumption in the second quarter, which seems coherent, as the measures and general fear to catch the virus prevented families from using vehicles. The current advances in technology also allowed this as it was easier to work from home given the circumstances (Banco de España, 2020).

This massive decline in consumption over the first quarters of the pandemic entailed a heavy increase in private saving. The saving rates over Europe had a massive rebound all across the euro area, with households saving up to 25%. To put it into perspective, the average euro area saving rate during the last quarter of 2019 was 13% (Eurostat) of their gross disposable income in the second quarter. The amount of savings were calculated to be exceeding €300 billion in the euro area (Banco de España, 2020).

Within this context, even if the increase was felt all over the Eurozone, the cases of France and especially Spain stand out. Spain was the one country of the euro area that recorded the biggest increase in household saving rate in the first half of 2020 reaching 25,7% of gross disposable income (BBVA, 2021). When talking about this heavy rebound in saving, in this particular situation, the conventional determinants of consumption (income, wealth, interest rates, etc.) and previous saving theory research are not enough to explain it and here we see what most articles seem to agree on: that there has to be an element of forced saving coming from the restrictions on mobility caused by the measures applied by the governments and from the general urge of citizens to keep themselves safe.

If we take a look at the data provided by the Bank of Spain and the European Central Bank, we see that most of the excess in saving during the lockdown period of the pandemic were turned in the form of bank deposits and lower household borrowing, where France and Spain once again showed themselves as the countries with the highest bank deposits, the rest was distributed much less among cash holdings, listed shares and investment funds.

When the pandemic prevention measures implemented by governments started to be eased during the third quarter of 2020, we started to see a bit of a gradual rebound of the pent-up demand that was created during the lockdown period, while there was an improvement across the board. Only durable, semi-durable and food items presented a growth in consumption whereas services, fuel and other non-durable goods remained below pre-crisis levels, although improving (Banco de España, 2020).

The introduction of new restricting measures due to a second wave in October halted again some of the recovery and continued to restrict consumption, which meant that saving would have to continue to be high for the remainder of the year.

From this arises the confusion in regards as to what these extra savings will be spent on, given the nature of the savings increase and its concentration among older population and people with higher incomes (essentially due to the fact that these groups were less exposed to the losses in labor income, seeing as they are mainly inactive or in sectors less affected [ECB,2021]) , as well as the fact that the uncertainty generated in this crisis is more serious than in previous crisis, it will depend on if the excess in saving decreases at similar rates observed during other periods of instability or if the accumulated savings will be spent as if it were a transitory increase in income (BBVA, 2021).

The spending will also depend on consumer's confidence and outlook for the future which there seems to be evidence of a recent rebound in confidence (Michael Haliassos, 2021), however we shouldn't expect a massive immediate surge on private consumption according to recent survey indicators (ECB, 2021).

3.METHODOLOGY

For this next part we will be describing the specifications of our empirical study on saving, our study mainly focuses on two variables, the real aggregate saving as well as the saving rates for the selected countries:

-Aggregate Saving: Represents the total saving of the household sector in national accounts. Gross saving is the part of the gross disposable income which is not spent as final consumption expenditure. Therefore, saving increases when gross disposable income grows at a higher rate than final consumption expenditure. Data obtained from Eurostat expressed in million euros after turning data into real terms with consumer price index with 2015 as a base.

-Saving Rate: It is defined as the gross household saving divided by the gross disposable income. Our data is gathered from Eurostat.

-Gross Domestic Product: Represents the total monetary value of all the final goods and services produced in a country in a time period, in our study we present this data in quarterly frequency and in real terms with consumer price index with 2015 as a base. Our data is also gathered from Eurostat.

We gathered data for five different countries in order to being able to make cross-country comparisons. We chose to study 5 of the largest and most important European economies. Since the United Kingdom left the European Union, we instead included Sweden as it also can give us a perspective for how the Nordic countries were affected by the pandemic. Some countries had available a larger amount of data than others, especially France which has data starting from 1980, while most other countries start around 1999. This also means that some countries may have some missing values of data, since some of them still may not have registered the latest figures.

The first aspect that we touch in our experimental study, is the analysis of cycle behavior for savings in each country, for this we use the Gretl software. For each country, in order to extract the cyclical component, we can use the Hodrick-Prescott filter on aggregate saving that have previously gone through a logarithmic transformation process in order to stabilize its variance. This filter consists of smoothing the data on a time series by removing mostly short-term fluctuations, thus revealing long-term trends, the process is controlled by the λ multiplier, its value depends on the frequency of a time series (in our case 1600 for our quarterly series).

After that we can determine several aspects like if saving follows a procyclical or countercyclical behavior with regards to its GDP thanks to time series graphs and a correlation matrix between the cyclical components of the variables for each country. The correlation coefficients we obtain determine how related two variables are, with the sign value we discover if the relation is pro or countercyclical and in order to determine if this is significant we also conduct a test where the null hypothesis is that the correlations coefficients are 0.

Another aspect we can estimate is cycle duration, to do this we will estimate some autocorrelation functions and observe where the highest and lowest coefficients of the lags are, by doing this we would obtain half the cycle which means that the full cycle is obtained by doubling that value, we also need to take into account that since our data is in quarterly terms the results we will obtain will be in quarters of a year, we have decided to take 20 lags as standard among all estimations, since this seemed like the most adequate number for what we were trying to achieve.

Finally, we will also take a look at other factors like persistence between values across time (via the same functions as the cycle duration estimation) and the percentage of volatility that a country's aggregate saving presents. By looking at its standard deviation we can infer how much that variable varies from their mean in percentage terms; if we divide those values with that of the GDP's cycle component we will also be able to study the relative volatility between these variables.

Last, we apply an ARIMA estimated using the time series of real saving up to the last quarter of 2019 to predict the values for the real saving of each country and compare them to the actual values observed during the COVID pandemic, thus measuring the impact of the latter. We prefer the use of ARIMA models over others like ARMA for the fact that all of the studied time series, like we will see below, are in need of a differencing process in order to become stationary, which is an essential factor for our analysis.

For the estimating process we used RStudio as our program of choice, the program makes estimating an ARIMA model relatively simple by the use of its *"auto.arima"* function, which quickly compares various ARIMA and SARIMA models and decides on a single *"best"* one, instead of having to manually determine each model. We also carry out other estimations other than just this, stationarity is a key issue in these types of models, so we also need a way of determining it, the Dickey-Fuller test is a good way of outlining this factor. If non stationarity is found we run that data through a process of differentiation in order to make it stationary. We also carry out various tests on each model in order to check its validity.

All the obtained ARIMA models will present a variation of this base equation, where φ_n represents the estimated parameters as well as the value for an autoregressive (AR) model meaning that the actual value of the variable depends of previous values of that same variable, Δ^d denotes the integration (I), in other words, the number of times that the times series has been differentiated in order to achieve stationarity, finally, μ_n represents the estimated parameters as well as the value for a moving average (MA) model, meaning that errors from previous periods can affect present values.

$$\Delta^d y_t = \varphi_1 \Delta^d y_{t-1} + \cdots + \varphi_n \Delta^d y_{t-n} + \mu_1 \varepsilon_{t-1} + \cdots + \mu_n \varepsilon_{t-n} + \varepsilon_t$$

In some models it may be the case that the estimated *"best"* model consists of a SARIMA model instead of an ARIMA one, in this case it means that we need to include a seasonal component, which is represented in the next equation with the components y_{t-s} and ε_{t-s} for seasonal autoregressive and seasonal moving average.

$$\Delta^d y_t = \varphi_1 \Delta^d y_{t-1} + \cdots + \varphi_n \Delta^d y_{t-n} + \varphi_n \Delta^d y_{t-s} + \mu_1 \varepsilon_{t-1} + \cdots + \mu_n \varepsilon_{t-n} + \mu_n \varepsilon_{t-s} + \varepsilon_t$$

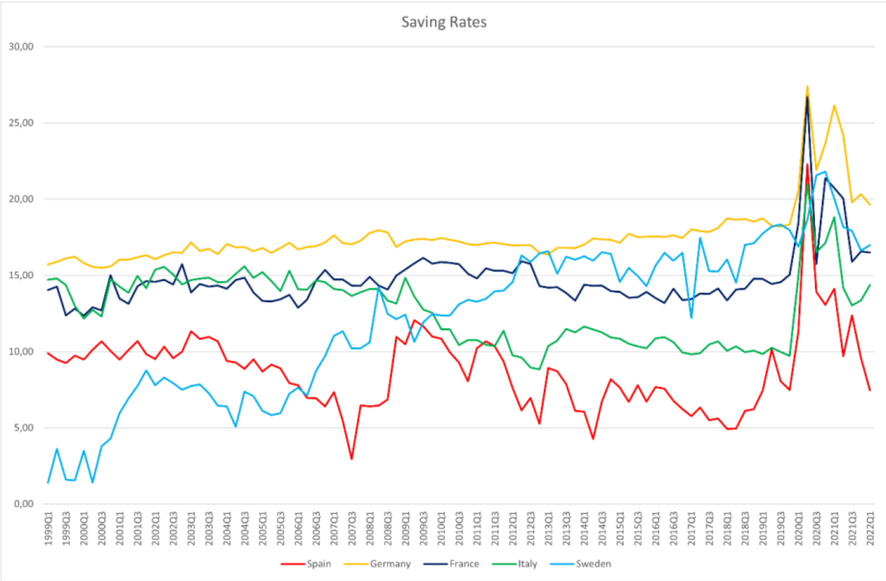
4.DATA

In this section we will be presenting some simple data explanation as well as descriptive statistics. In our literature review we have analyzed several informative pieces written by other authors on the economic consequences of the pandemic, however, we can also provide some analysis of our own from our data compilation.

If we take a look to our data for saving rates displayed in figure 1 below we can already draw some immediate conclusions. First and foremost, we can observe the differences in magnitude between the percentages of saving rates among countries, in which Germany has always remained on top of the other countries whereas Spain has remained below the rest historically.

However, this all changes when the pandemic hits, like we told in our literature review, all countries suffer a massive increase in their saving rates coming in the first quarter of 2020 which can clearly be seen here, it is interesting to note that even though the data for the crisis of 2008 is also present, the peaks reached in that period are neither taller nor as abrupt as the ones present during the Covid-19 crisis, this is probably due to the government measures put to stop the spread of the virus.

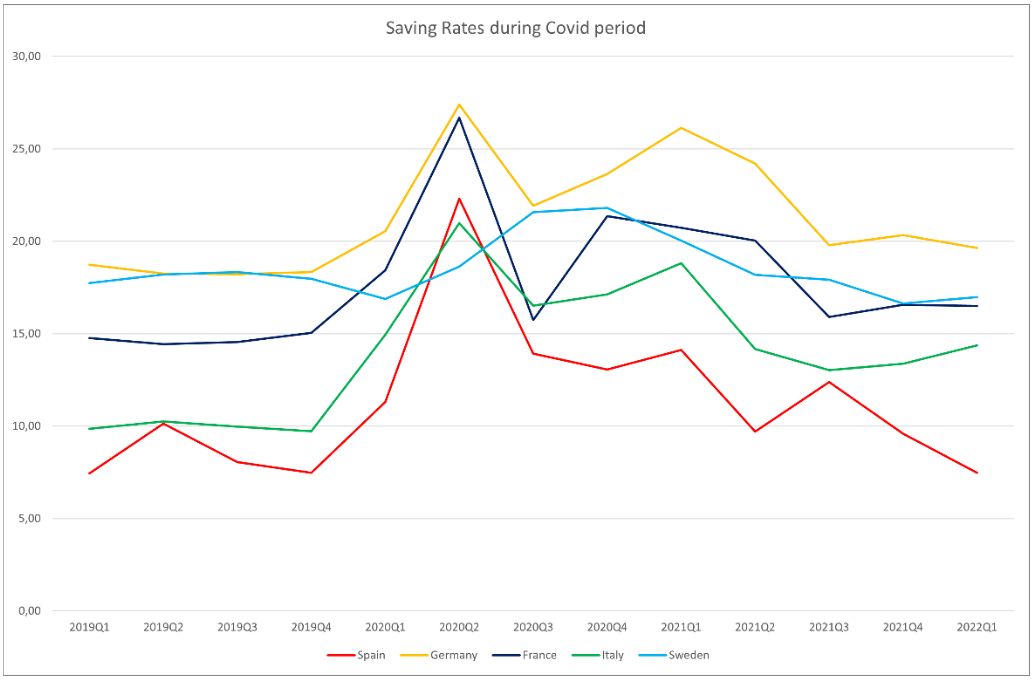
Figure 1: Saving rates comparison across countries.



Source: Own elaboration, Data: Eurostat.

If we take a closer look at each country in that period we can also observe in which countries the saving rates have increased the most, since it can be a bit hard to examine all the lines together we can look at figure 2 which contains only the relevant period to study.

Figure 2: Closer look at saving rates during pandemic period.



Source: Own elaboration, Data: Eurostat.

Now we can see more clearly which nations have undergone the biggest shock. We can observe that it is during the second quarter of 2020 where all the nations reach their maximum values.

Germany stands, once again, at the top, reaching a peak of 27,4% in their saving rate, behind follows France with a peak of 26,69% and after that we see Spain, which even though has mostly remained below the rest previously, like we saw in our literature review, it was one of the countries whose savings were the most affected by the pandemic reaching a maximum of 22,3% saving rate according to our data, after that it's followed by Italy.

In the case of Sweden, it is apparent that the shock to saving rates has not been as severe as in other countries, probably due to the fact that the imposed restrictions were not as severe as in the other nations and that a lockdown was not even enforced.

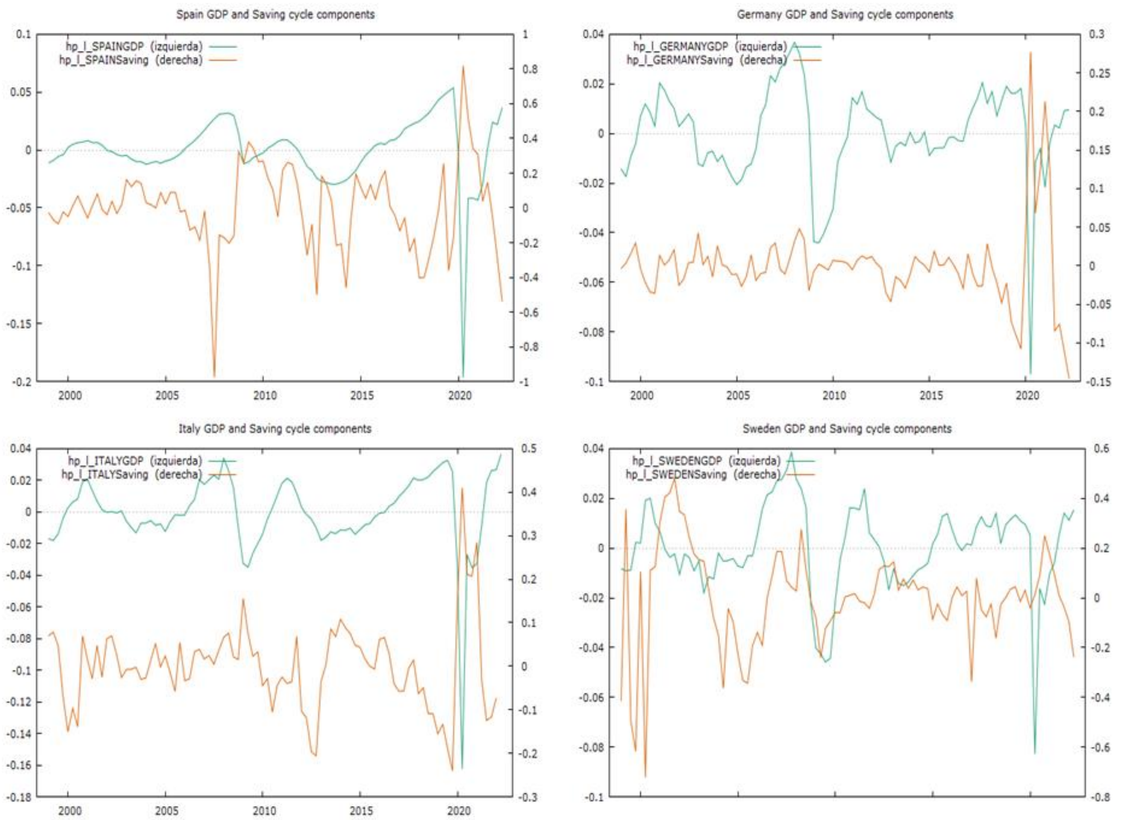
After that period, we can see a drop of the saving rates during the next one, this can be attributed at the easing of the pandemic measures imposed by the various governments. The following increases can also probably be explained by the reinstatement of said policies after additional waves of the pandemic hit during the rest of 2020. After that year the values slowly decreased until getting close to the present signaling the passing of the pandemic.

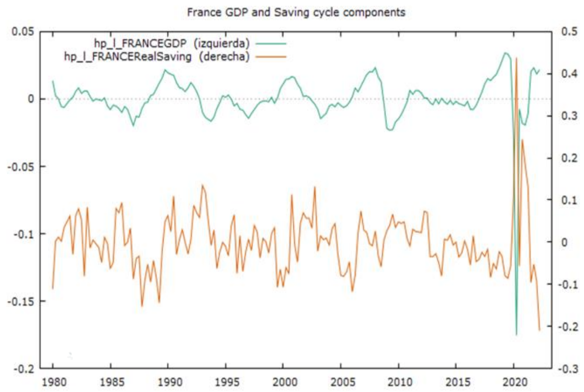
5.RESULTS

5.1. Cycle Analysis

For the first part of our empirical analysis. We start by analyzing the cyclical behavior of each country in our complete time series (from 1999 Q1 to 2022 Q2), for this we can put together the five graphs each containing both the cyclical component for both GDP and Saving extracted with the Hodrick-Prescott filter.

Figure 3: Combined graphs of saving and GDP cycle components across countries.





Source: Own elaboration, Data: Eurostat.

** These graphs collects data for the "Covid period" (1999 Q1-2022 Q2).*

Graphs show the cycle component for both GDP cycle component in the green lines and the Saving component with the orange lines. "hp_l_..." refers to the Hodrick-Prescott filter used on the logarithms of each variable

The scale on the left makes reference to the value of GDP and the one on the right to the value of saving.

If we observe each graph individually we can observe how for most countries the graphs present many similarities (with France presenting us with a much more abundant set of data like we have mentioned before), with all of them showing a quite volatile spread of data. In the case of the cyclical component of saving this is attributed, like we will study later, to the high amount of volatility that all countries present in this variable; compared to the much fewer fluctuating lines for the GDP cycle component.

The inclusion of the Covid pandemic period in the charts has a heavy distorting effect in all of the graphs as opposed to if we had not included it, however it is thanks to this recession and, to a lesser extent, the 2008 financial crisis that we can more clearly see the cyclical behavior that saving and GDP show with respect to each other.

If we take a close look at the path that saving follows, we see clearly how when GDP grows, saving instead lowers its value and the opposite also happens respectively, especially in the aforementioned crisis, during 2020 most countries reach their peak value of saving and the lowest value in their GDP, which is why it has that distorting effect in the time series.

It seems like Germany, France, Italy and less excessively, Spain, present us with a similar situation, all these countries display the same standard fluctuations over time with high dips of GDP and peaks of saving in periods of crisis, the signs of countercyclical behavior, this however is not the case for the remaining country of Sweden.

The case of Sweden is an interesting one, like we will also see further below with our ARIMA analysis. It is clear from the very beginning that this series presents a different pattern to that of the other countries. We can see the usual conditions for countercyclical behavior, however in this case, especially during the times of recession it can be seen that saving can follow an acyclical or even procyclical trend in relation to its GDP.

Another difference in this one is that, when compared to the graphs for other countries, the fluctuations were so high that distorted the entire chart and made it hard to observe the cyclic behavior, but here what happens is that the impact of the pandemic on GDP and saving was not as hard on Sweden as in the rest of the countries, we will see this trend along our analysis.

In order to determine much more exactly the cyclical behavior of saving for each country we need a more empirical approach; we can carry out correlation matrix for each country's GDP and saving cyclical components like we see in the next table; we will be focusing on the data for our partial time series without the pandemic data (1999 Q1 to 2019 Q4).

Table 1: Correlation coefficients between GDP and saving with P-value.

	Spain	Germany	France	Italy	Sweden
Correlation (without Covid)	-0,178	0,241	-0,047	-0,109	0,095
P-value (without Covid)	0,104	0,027	0,555	0,325	0,392
Correlation (with Covid)	-0,521	-0,4	-0,533	-0,644	0,024
P-value (with Covid)	0,000	0,000	0,000	0,000	0,8151

** "Without Covid" data encompasses the period from 1999 Q1 to 2019 Q4*
"With Covid" data encompasses the period from 1999 Q1 to 2022 Q2
Source: Own elaboration, Data: Eurostat.

When looking at this table we can immediately draw some conclusions, like we said previously in our commentary for Spain, France and Italy these countries display a similar situation, with the negative values obtained we can certainly determine that saving behavior for these countries is countercyclical, which coincides with the conclusions we drew from the graph analysis.

We also obtain the p-value for these correlation coefficients; these countries all share a p-value above our significance coefficient so we cannot reject the null hypothesis of the correlation between GDP and Saving components being equal to 0.

These resulting coefficients are probably due to the fact that, especially during recessions, the effects of a decrease in economic activity, thus GDP, are generally reflected by decreased levels of income which when aided by added levels of uncertainty during these periods people tend to respond by increasing their levels of saving and decreasing their consumption, like we saw in our literature review, now we can observe this phenomenon in this cycle analysis.

The situations for Germany and Sweden, however, are a bit different, in the case of Germany we see a positive correlation between saving and GDP which would seem to indicate that German saving is procyclical, with the obtained p-value this time we can reject the null hypothesis of the correlation between GDP and Saving components being equal to 0.

For Sweden we already explained previously how its graphic had a much different behavior to that of the other countries and with this result we can confirm that. Sweden's GDP and Saving cycle components' correlation coefficient is displayed as positive, this means that while very close to 0 the correlation between these two components is closer to being procyclical, which heavily contradicts both what we expected and the results for other countries; however, the p-value provided by the software indicates that we do not reject the null hypothesis for the correlation coefficient being 0.

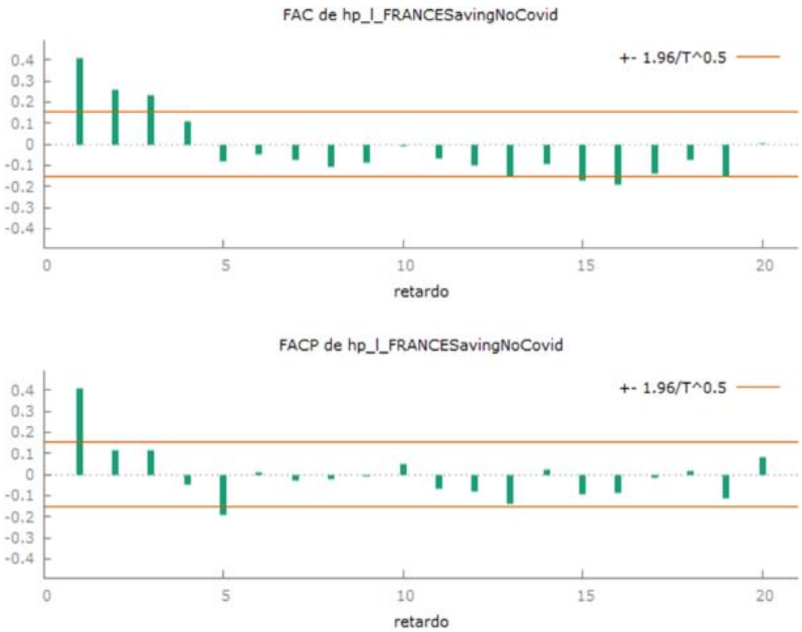
In this case, our previous theory may not apply, we need to understand the relation between saving and GDP, saving is determined by the remaining income after consumption, and income could more or less be determined by the remaining figure after removing net taxes from the GDP. Knowing this, we can infer that government measures could heavily impact how households manage their savings.

One last thing to mention from this section is that, while we chose to focus on the partial time series, performing the same estimation on a complete time series with the Covid period really helps to see the huge impact of the pandemic, for most countries the results wouldn’t change much aside from heavily reducing its coefficients, but for Germany this correlation coefficient actually would be negative, meaning that the pandemic effects would be enough to change our first estimation of a procyclical behavior of saving.

When it comes to the significance tests, some changes are observed too, for Spain, Italy and France the p-values change so that we would reject the null hypothesis of correlation coefficients being equal to 0, Germany and Sweden would be the only ones that remained the same in this instance.

Now for the next part we will explore the duration of the saving cycle for each country as well as its persistence between periods, we will perform several autocorrelation functions and find where the maximum and minimum lag coefficients are. For this process we will mainly be focusing on the partial time series without Covid, since like we will see, it can impact our results significantly.

Figure 4: Combined autocorrelation functions for each country



Source: Own elaboration, Data: Eurostat.

** These graphs collects data for the "period without Covid" (1999 Q1-2019 Q4).*

These are the autocorrelation functions for the cyclical component of each country, in a horizon of 20 lags.

Starting with Spain, according to figure 4, the highest coefficient is shown to be on the first lag, with the lowest being in lag number 11 this would be equivalent to half of the cycle which means that the full cycle for saving in Spain would last 22 quarters or around 5 and a half years. Doing the same with the Covid series actually reduces the length of the cycle to about 16 quarters or 4 years.

One last element we can determine with this function is by looking at the first two lags which exhibit significant positive coefficients, we can conclude that there is a degree of persistence between successive values of Spanish saving.

Secondly, for Germany, by looking at the coefficients that the program also provides, we can see that the highest and lowest coefficients are present in the first and tenth lags respectively, meaning that the full cycle of German saving would be of 20 quarters or 5 years we can also appreciate that this function shows a lot of fluctuations between positive and negative values of its coefficients.

Executing this same process with the series containing the Covid period would yield us a period of 10 quarters or 2 and a half years, so in this case, the inclusion of Covid data has incredibly affected the final result, which reflects the impact of the pandemic in households.

If we analyze the degree of persistence in German saving, three lags present positive value but only the first lag has a significant coefficient, so we can assume that German saving has a low degree of persistence.

Thirdly, in the case of France, we see that the maximum and minimum figures appear in the first and eighth lag respectively which would put the French saving's cycle with a duration of 16 quarters or 4 years. For France, there is actually no difference between the results obtained with the time series containing the Covid period, it remains 16 quarters with the only difference being the value of the coefficients.

The same would be said for its degree of persistence, in both series we find positive coefficients in the first 4 lags with 3 of them being significant, so we could assume that the French saving has a higher degree of persistence.

For Italy, the largest positive coefficient is found at the first lag like we have seen until now, however this time the function seems to exhibit a much longer than usual cycle when compared to the previous analysis, we can see how the lowest coefficient is present at a far point in the fourteenth lag, which would make the Italian saving's cycle a length of 28 quarters or 7 years.

On the other hand, if we take the full time series and perform the estimation on this instance the cycle obtained becomes much shorter with the lower coefficient being in the fifth lag it would make it so the full cycle is 10 quarters or 2 and a half years, a much shorter duration and more in line with some of the previous results.

Lastly, in terms of persistence we can observe 3 positive coefficients with 2 of them being significant, so we can infer that there is a certain degree of persistence in the Italian saving.

Finally, we have the case of Sweden, we find a higher abundance of significant lags, as opposed to previous results, here the highest coefficient is actually present in the second lag meaning that current Swedish saving is actually more correlated to that of two previous quarters; the lowest coefficient is located this time in the eleventh lag, that would make the cycle of Swedish saving last 22 quarters or 5 and a half years. If we do the same with the full series the result doesn't actually change aside from slight deviations in the value of some coefficients.

Last but not least if we examine the degree of persistence we can see that the first 5 lags possesses positive coefficients with 3 being significant, we can deduce that there is a higher degree of persistence for Swedish saving, same can be said about the full series.

Another aspect that can be interesting to take a brief look into is comparing GDP's cycle duration with the saving, on average when looking at the results without Covid, Germany, Italy and Sweden present a shorter GDP cycle compared to its saving cycle, with all of these sharing a cycle duration of 16 quarters or 4 years. France and Spain on the other hand display a longer GDP cycle duration, the case of Spain is particularly noteworthy because presents the longest cycle we have seen so far at 42 quarters or 10 and a half years, when examining this particular case with the complete time series the cycle becomes again 16 quarters or 4 years, similar to other countries.

To finish with this section, we can delve deeper into the topic of volatility by examining both the standard deviations as well as the relative standard deviations to GDP from the cyclical component for each country comparing the full series and the partial series without the pandemic period.

Table 2: Saving and GDP volatilities for both time series.

SAVING	Spain	Germany	France	Italy	Sweden
Covid	0,243	0,053	0,072	0,099	0,202
No Covid	0,209	0,020	0,054	0,064	0,208
GDP					
Covid	0,029	0,019	0,018	0,024	0,018
No Covid	0,013	0,016	0,009	0,013	0,016
RSD Covid	8,422	2,810	4,044	4,098	11,190
RSD No Covid	16,157	1,274	5,830	4,923	13,141

** "No Covid" data encompasses the period from 1999 Q1 to 2019 Q4*
"Covid" data encompasses the period from 1999 Q1 to 2022 Q2
Source: Own elaboration, Data: Eurostat.

From this table we can draw some interesting conclusions, firstly if we take a look at just the standard deviations of saving cycle component for the period without the pandemic, we see that Spain has the largest overall volatility, followed by Sweden.

Furthermore, in all cases, saving across all countries has remained more volatile than GDP both in the partial series and in the complete series, saving is always more susceptible to shocks than the GDP. Secondly, for every country except Sweden the volatility of the complete series has remained higher, this continues to confirm the findings we have made previously over the non-standard approach Sweden took to the pandemic. Italy and Germany were the countries whose saving volatility increased the most from one series to another, with Sweden clearly being the least affected.

If we take a look at the relative standard deviations with GDP, we immediately see the magnitude of all saving volatility is much higher than that of GDP, with Sweden actually showing a much greater value of relative deviation than other countries. This comes from the fact that Sweden's GDP has the lowest volatility in comparison with its saving among all countries. If we take out the pandemic period of the series, it is clear that Spain not only has the highest relative deviation, with saving being 16 times more volatile than GDP, but also experiences the highest variation from one to another.

We see that for all countries except Germany, the saving volatility relative to GDP is lower in the complete series. This can probably be attributed to the fact that the decrease in GDP volatility from removing the pandemic period is more significant in the equation than the reduction in saving volatility.

5.2. ARIMA

In this next part, we will report the results of our studies providing a description for the findings in the predictions and real values of each country and then we include detailed explanation for cross-country components.

Starting with Spain, the first step in all of these models is to estimate the stationarity of the time series of each country, so we conduct the augmented Dickey-Fuller test for the real aggregate saving of Spain, for a significance level of 5% we find that the base time series presents a unit root **(p-value=0,098**), so we don't reject the null hypothesis of non-stationarity. To fix this we run a process of differentiation on the time series and perform the Dickey-Fuller test once more, from the resulting p-value **(p-value<0,01)** we know that the series is finally stationary.

After running the series through the program, it provides us with an **ARIMA (1,1,1)** model which means that the real aggregate saving for Spain is affected by the autoregressive observations from one previous period, one moving average meaning that the errors of a previous period also affect its current value and, like we determined earlier, one degree of differentiation to make the series stationary.

To determine the validity of the model we perform the Ljung-Box test, which takes into account the residuals from our model so as to determine if the residuals have some sort of dependence on each other. From its result **(p-value=0,472)** we don't reject the null hypothesis of independent distribution with the residuals, so we can assume that our model is correctly fitted. Another component we can take into account is the mean absolute percentage error (MAPE), which can help infer more or less how accurate our forecasting was. For Spain, the value obtained was of **13,48%**, meaning that the average difference between the forecasted value and the actual value is that percentage. While improvable, we can infer that the model has low but acceptable accuracy.

After this we forecast the values for the next ten quarters, the actual values and prediction are presented in table 3:

Table 3: Actual and predicted values for Spanish saving.

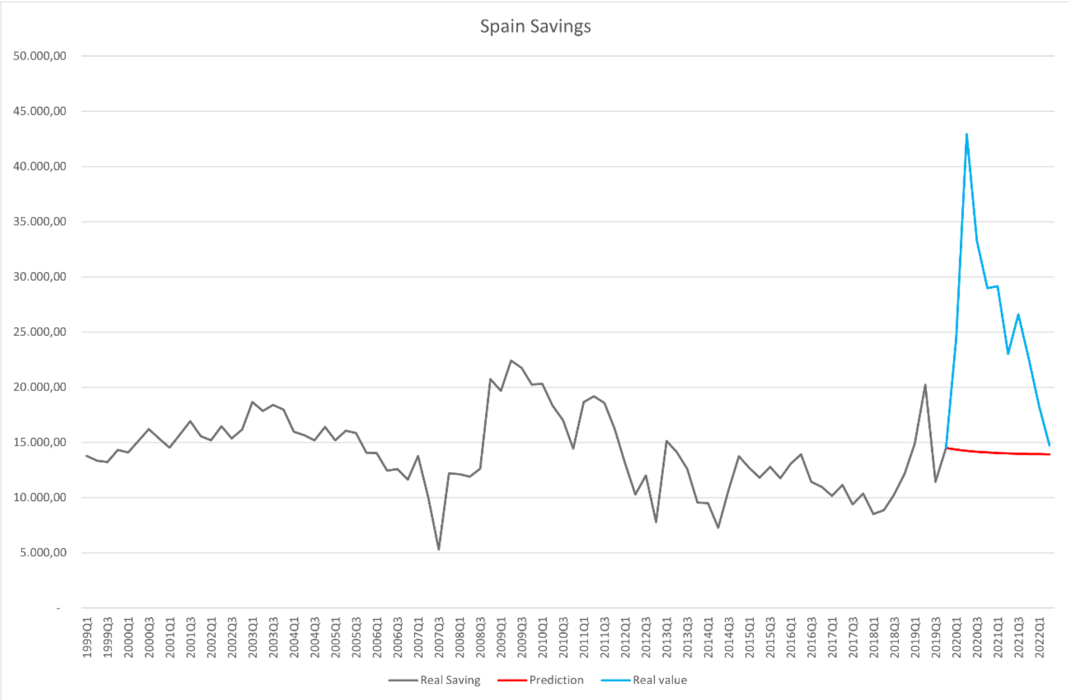
TIME	ACTUAL VALUE	PREDICTION
2020 Q1	**24.428,70**	**14.338,26**
2020 Q2	**42.927,05**	**14.225,61**
2020 Q3	**33.243,34**	**14.141,76**
2020 Q4	**28.969,36**	**14.079,36**
2021 Q1	**29.161,50**	**14.032,91**
2021 Q2	**23.034,33**	**13.998,34**
2021 Q3	**26.603,64**	**13.972,60**
2021 Q4	**22.571,77**	**13.953,45**
2022 Q1	**18.320,20**	**13.939,20**
2022 Q2	**14.730,42**	**13.928,59**

Source: Own elaboration, Data: Eurostat.

From the results we can see that the ARIMA model predicted a gradual decrease of the aggregate saving during the selected period. The reality is that during the first quarter of 2020 aggregate saving already increased by more than 10.000 million euros compared to the predicted value. The highest peak of the actual value is reached during the second quarter of 2020 and it gradually lessens from there, until the second quarter of 2022 where the actual value and the prediction seems to align again more or less.

In the following graph the contrast between actual values and predictions can easily be observed, showing the striking difference between the shock of the pandemic and the estimated values.

Figure 5: Spanish saving data with actual and predicted values.



Source: Own elaboration, Data: Eurostat.

In the case of Germany, we start the same way, the stationarity test tells us that the series needs differencing (**p-value=0,92**), knowing this and once we are certain of the stationarity we run the program and obtain an ARIMA SAR(1) model **(1,1,1)(1,0,0)**, similar to the one we obtained for Spain except this model contains a Seasonal autoregressive parameter not seen before.

From our validity tests we conclude that the model is well fitted (Ljung-Box test, p-value=**0,727**) and we get a MAPE value of **1,53%** meaning that we can expect reasonable accuracy from our forecasting, which can be observed in table 4:

Table 4: Actual and predicted values for German saving.

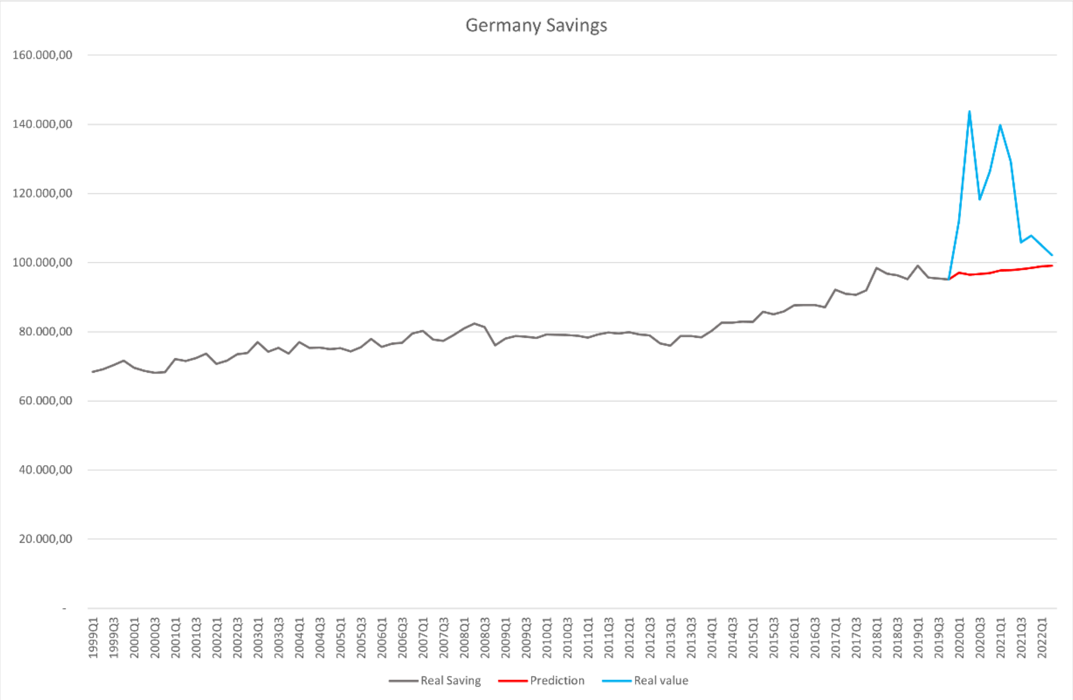
TIME	ACTUAL VALUE	PREDICTION
2020 Q1	**112.031,56**	**97.026,15**
2020 Q2	**143.789,65**	**96.475,55**
2020 Q3	**118.216,53**	**96.719,27**
2020 Q4	**126.490,92**	**96.931,04**
2021 Q1	**139.789,98**	**97.731,77**
2021 Q2	**129.213,12**	**97.810,65**
2021 Q3	**105.877,90**	**98.116,79**
2021 Q4	**107.766,27**	**98.411,08**
2022 Q1	**104.937,41**	**98.876,75**
2022 Q2	**102.166,78**	**99.130,44**

Source: Own elaboration, Data: Eurostat.

Unlike the results for Spain where we saw a gradual constant decrease, in the case of Germany the predictions indicate a few mild fluctuations along the time period. Like in Spain, the actual values observed during the pandemic were much higher than the ones predicted, with the maximum being present once again during the second quarter of 2020 and the first quarter of 2021.

Like before, we can fully observe the contrasting values of predictions and real values in figure 6. One thing to note is that the difference between the real values and predictions doesn't seem as big as the one in for example Spain or Italy but is similar to the one seen in France which we see further below.

Figure 6: German saving data with actual and predicted values.



Source: Own elaboration, Data: Eurostat.

Continuing now with France, it is an interesting one to study since we have more data to feed the ARIMA program with which should result in more accurate predictions as well as this country being one of the first to be in contact with Covid patients. So, once again after performing the stationarity tests, this series also needs differencing in order to become stationary (**p-value=0,077**). The model we obtain from this series' estimation is an **ARIMA (2,1,0)(0,0,1)**, in this case the number of autoregressive factors from previous periods are two, one degree of differencing to get stationarity and there is no moving average to explain the model MA(0) however there is one seasonal moving average component.

Our Ljung-Box test for examining the residuals confirms that they are independent **(p-value=0,74)** and we can assume that the model is well fitted. This time we get a MAPE value of 4,13%, meaning that, like we thought earlier, our prediction is going to be reasonably accurate. The forecasted and actual values for the chosen future horizon are displayed next:

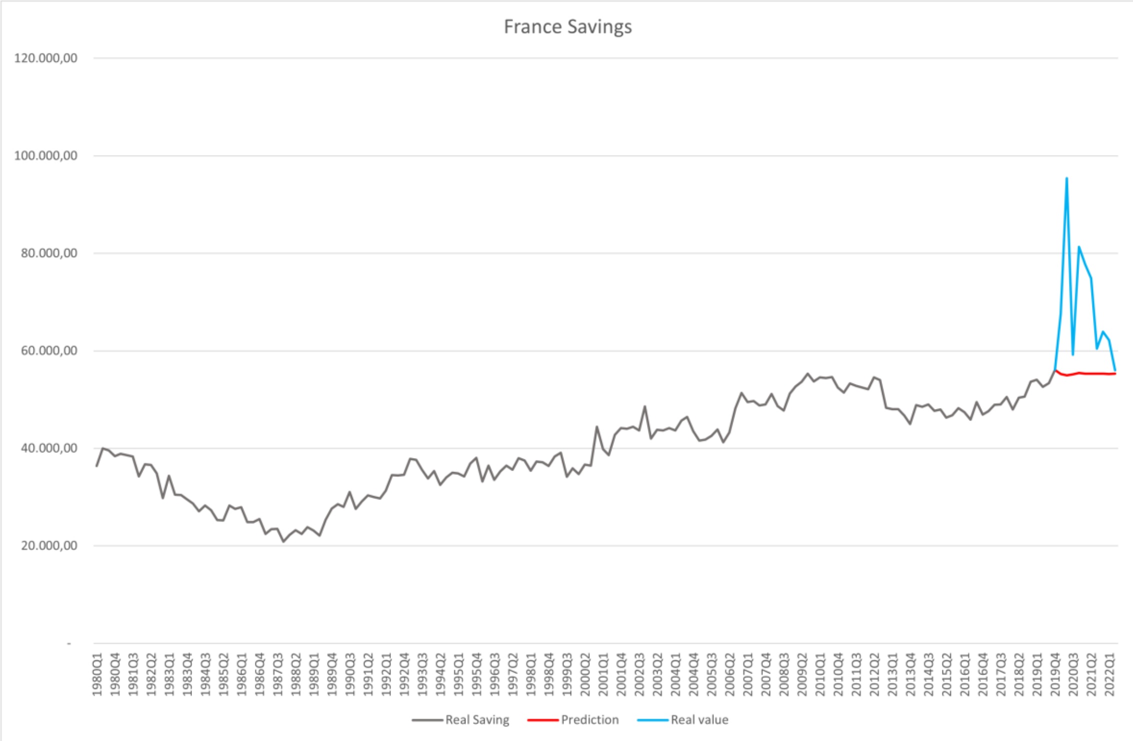
Table 5: Actual and predicted values for French saving.

TIME	ACTUAL VALUE	PREDICTION
2020 Q1	**67.627,69**	**55.221,01**
2020 Q2	**95.420,94**	**54.951,43**
2020 Q3	**59.225,30**	**55.206,91**
2020 Q4	**81.346,59**	**55.437,96**
2021 Q1	**77.801,20**	**55.317,51**
2021 Q2	**74.856,78**	**55.320,89**
2021 Q3	**60.445,89**	**55.339,38**
2021 Q4	**63.940,32**	**55.332,52**
2022 Q1	**62.199,05**	**55.221,85**
2022 Q2	**56.013,30**	**55.333,20**

Source: Own elaboration, Data: Eurostat

Like we saw in the estimations for Germany, instead of the prediction values following a straight downward or upward trend they present mild fluctuations between periods; the predictions don't vary much over time and they all stay within a similar range. When compared to the actual values we can see once again that these are much higher than the predictions. Again, the maximum value is present in the second quarter of 2020. Like we said earlier with Germany, these two countries seem to share a lower difference between the predicted and actual values (can be more easily observed in the graph) contrary to what we observe in the graph for Spain and later Italy.

Figure 7: French saving data with actual and predicted values.



Source: Own elaboration, Data: Eurostat.

After that we move onto studying Italy. Like all previous times we determine the series' stationarity with the augmented Dickey-Fuller test **(p-value=0,29)**, again there is need for differencing in order to make the time series stationary. After this, the program yields us with an **ARIMA (0,1,1)(0,0,1)**, in this case there is no autoregressive component in the model, one degree of differentiation like we said and one component for moving average and a component of seasonal moving average.

The Ljung-Box test for residual validation yields a **p-value = 0,92** so we can assume again that the model is correctly fitted, the MAPE value for the Italian saving ARIMA model is **4,48%** so we can again infer that our predictions are reasonably accurate. Once we forecast, we obtain the following results:

Table 6: Actual and predicted values for Italian saving.

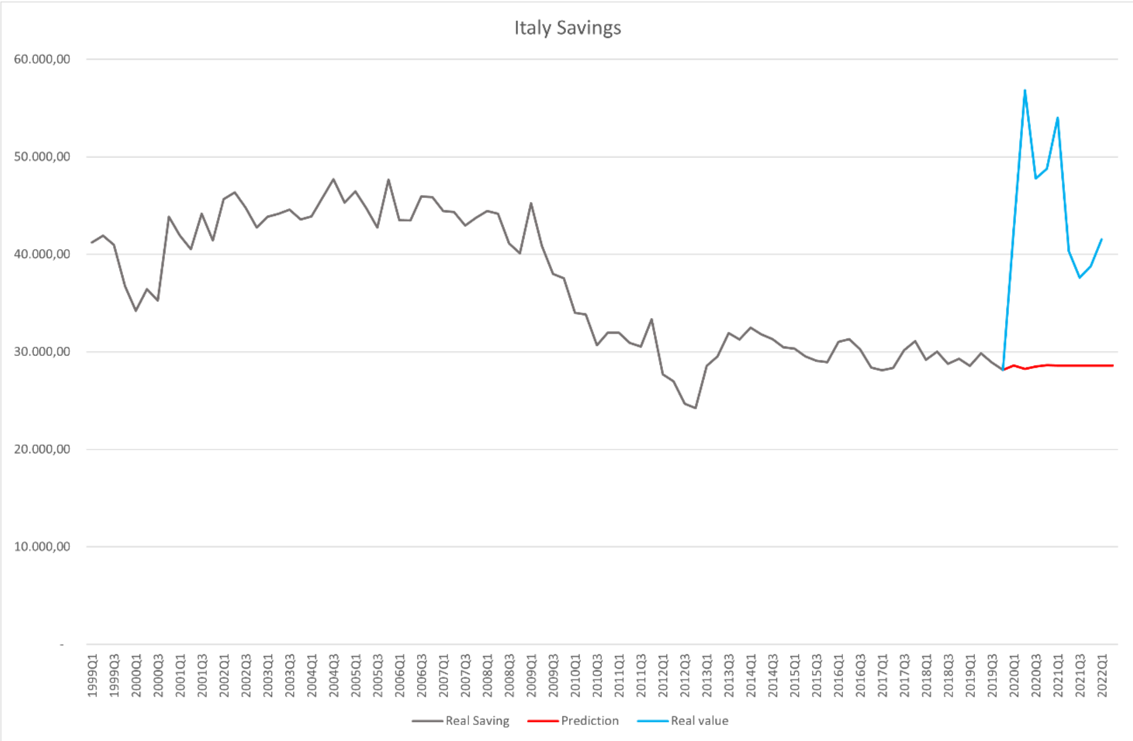
TIME	ACTUAL VALUE	PREDICTION
2020 Q1	42.568,70	28.591,31
2020 Q2	56.836,73	28.236,49
2020 Q3	47.774,03	28.508,55
2020 Q4	48.773,66	28.649,17
2021 Q1	54.025,13	28.612,04
2021 Q2	40.311,78	28.612,04
2021 Q3	37.614,87	28.612,04
2021 Q4	38.805,90	28.612,04
2022 Q1	41.515,24	28.612,04
2022 Q2	-	-

Source: Own elaboration, Data: Eurostat.

In this case we see an interesting result, the predictions follow fluctuations similar to the ones observed before but when reaching the first quarter of 2021, the predicted values from there on become all the same and continue until the end of the selected period. This scenario is obviously highly unrealistic in the real world however we can deduce that the predicted values if we were to choose another type of ARIMA model would not vary much from these results.

When taking into account the actual values, obviously the same thing doesn't happen, but again we see how all the real values are higher than the predicted ones with the maximum present in the second quarter of 2020. One critical difference we can observe here and in the graph when compared to the previous results is the fact that the last value does not come close to the predicted values like we observed in the former examples.

Figure 8: Italian saving data with actual and predicted values.



Source: Own elaboration, Data:Eurostat.

Finally, we have the case of Sweden, following the process for all previous countries we determine that the time series for Sweden needs differencing **(p-value=0,65)** of one degree in order to become stationary. The program estimates an **ARIMA (1,1,0)(1,0,1)**. This model determines that an autoregressive factor is needed as well as one degree of differencing, one seasonal autoregressive and one seasonal moving average for the saving of Sweden. Following with the usual Ljung-Box test for residuals **(p-value=0,16)** we don't reject the null hypothesis of independent residuals and assume a correctly fitted model, from the MAPE with a value of **11,33%** we can expect low but reasonable accuracy, once again we forecast for a horizon of ten quarters in the future:

Table 7: Actual and predicted values for Swedish saving.

TIME	ACTUAL VALUE	PREDICTION
2020 Q1	10.568,38	11.619,80
2020 Q2	11.223,56	11.306,89
2020 Q3	12.200,21	11.617,59
2020 Q4	14.413,52	11.740,80
2021 Q1	13.455,53	12.129,68
2021 Q2	12.441,55	11.944,29
2021 Q3	11.438,48	12.203,22
2021 Q4	10.970,43	12.317,61
2022 Q1	10.339,42	12.603,11
2022 Q2	8.990,67	12.544,90

Source: Own elaboration, Data: Eurostat.

In this case like we have seen in all previous estimations the values of saving predicted for Sweden don’t follow a steady decreasing or increasing trend. However, in this case, the predicted values for aggregate saving are higher than the observed values during the first two quarters. After that, the actual values do exceed the predictions only to fall under them once again in the third quarter of 2021. Another difference is that for Sweden the highest value of saving is reached in the fourth quarter of 2020.

This behavior can be seen much more easily in the graph: the differences between predicted and actual value also don’t appear as large as in the previous examples, however we will examine this further below, we can also appreciate how in this case the final values we obtain don’t seem to be converging between each other which is something that most of the other countries did present.

Figure 9: Swedish saving data with actual and predicted values.

Source: Own elaboration, Data: Eurostat.

To conclude, the next table displays the percentage differences between the predicted values and the observed values for each country and each quarter, as well as the average value.

Table 8: Differences between actual value and predicted value of saving across countries.

TIME	Spain	Germany	France	Italy	Sweden
2020 Q1	70,37%	15,47%	22,47%	48,89%	-9,05%
2020 Q2	201,76%	49,04%	73,65%	101,29%	-0,74%
2020 Q3	135,07%	22,23%	7,28%	67,58%	5,01%
2020 Q4	105,76%	30,50%	46,73%	70,24%	22,76%
2021 Q1	107,81%	43,03%	40,64%	88,82%	10,93%
2021 Q2	64,55%	32,11%	35,31%	40,89%	4,16%
2021 Q3	90,40%	7,91%	9,23%	31,47%	-6,27%
2021 Q4	61,76%	9,51%	15,56%	35,63%	-10,94%
2022 Q1	31,43%	6,13%	12,63%	45,10%	-17,96%
2022 Q2	5,76%	3,06%	1,23%	-	-28,33%
Mean	87,47%	21,90%	26,47%	58,88%	-3,04%

Source: Own elaboration, Data: Eurostat.

First and foremost, we can clearly see that Spain is the country that presents the most striking difference between the predicted and actual figures of saving with more than 200% difference between the real value and its prediction during the second quarter of

2020. If we examine the rest of the figures and with a mean value of **87,47%** it leads us to believe that Spanish households have been the most affected by the pandemic and the measures established to contain it, since the predicted values were so low in comparison, the impact on the Spanish economy must have been of great magnitude in order to exhibit such great difference with most quarters having close to 100% level of difference between estimation and reality.

The second country that we could say was most affected was Italy, which clearly exhibits the second highest values of differences and has an average difference of **58,88%.** These two economies portray a lot of similarities in terms of how they were affected during the pandemic in terms of their household saving.

Like we pointed out earlier, Germany and France are the other two countries that show similarities in terms of our study. One thing that all countries besides Sweden have in common is the fact that the highest difference between figures is in the second quarter of 2020. However, for Sweden it's the opposite: we can appreciate an abundance of negative values coming from the fact that in many times the predictions were actually higher than the real value. In addition, Sweden presents the lowest average differences meaning that in terms of adjusting to reality this model has been the most accurate.

For all countries, except for Italy and Sweden, the differences between prediction and actual value decrease overtime during the selected period until the last quarter. This isn't the case for those two and we can observe how in the last quarter they still exhibit heavy differences and don't converge to a similar value.

6.CONCLUSIONS

The Covid-19 pandemic has shown us the consequences of a situation we could not expect, the deployed government measures have taken a huge toll in the economy and more specifically the large increase in household saving. To determine this, we carried out an analysis with the purpose of getting a picture of exactly how big this impact was.

From our cyclical analysis of saving, we sought to determine mainly two things: saving cycle behavior and saving cycle duration. We found that for most of the countries we chose to study there was presence of countercyclical correlation between GDP and saving. The only exceptions were Sweden and Germany, that exhibited more of an acyclical and procyclical behavior respectively. We determined that saving cycles presented a fairly long duration of a cycle, of about more than 20 quarters on average.

We performed these estimations in two time series with one of them having the pandemic period removed. We found that in some instances the addition of the Covid-19 period had some compelling effects, with important changes to both the cyclical behavior assessments as well as variations to cycle durations, showing us the magnitude of this epidemic.

Volatility and persistence were also factors that we were able to determine. In general terms, saving has shown to be much more volatile than GDP and with the Covid-19 epidemic increasing these values even more. As for the persistence, all countries seemed to show a certain degree of persistence between current and previous saving values.

We also carried out an ARIMA process in order to further define the impact of the pandemic on household saving. We found that all countries besides Sweden (who actually had lower actual values) had a much lower expected value for saving during the pandemic period, with heavy deviations of up to 200% between the actual value and the predictions in some cases.

This study however presents some potential limitations, mainly coming from our short available time series, being only approximately 20 years, meaning that our cycle behavior and duration analysis were probably determined in terms of mostly the Great Recession, which affected our selected countries for a long time, especially Spain, we would have liked to have more extensive data that went more into the past. In the future we could also further extend our research in this topic by studying the reason for those cross-country differences, perhaps they come from the distinct family behavior across countries or maybe from different political interventions, etc.

Overall, our study has shown us how important it is for later research to take into account the epidemic's repercussions, since we have observed firsthand how much results can vary as well as teaching us how the selected countries have tackled the measures to control the pandemic differently, the inclusion of Sweden in our studies has been a great addition in order to explore these different perspectives.

7.REFERENCES

-Adema, Y. & Pozzi, L. (2015). Business cycle fluctuations and household saving in OECD countries: A panel data analysis. *Elsevier*.

-Arroyo, J. (2020, March). Coronavirus: Infectados en España y la evolución del brote desde el origen. *Redacción Médica*. https://www.redaccionmedica.com/secciones/sanidad-hoy/coronavirus-infectados-espana-y-evolucion-covid19-desde-origen-4148

-Cannari, L. (1994). Do deemographic changes explain the decline in the saving rate of Italian households? *Cambridge University Press*.

-Cuenca, J. A., Martínez Carrascal, C. & del Río, A. (2021). Household Saving During the Pandemic and Its Possible Effects On the Future Recovery In Consumption. *Banco de España*, 25-28.

-de Bondt, G., Gieseck, A., Herrero, P. & Zekaite, Z. (2019). Disaggregate income and wealth effects in the largest euro area countries. *European Central Bank*, *2343*.

-del Río, A. & Cuenca, J. A. (2020). Euro Area Household Income and Saving During the First Wave of the Pandemic. *Banco de España*.

-Dossche, M., Krustev, G. & Zlatanos, S. (2021). COVID-19 and the increase in household savings: an update. *European Central Bank*, p*ublished as part of the ECB Economic Bulletin, Issue 5/2021.*

-Dossche, M. & Zlatanos, S. (2020). COVID-19 and the increase in household savings: precautionary or forced? *European Central Bank*, *published as part of the ECB Economic Bulletin, Issue 6/2020.*

-Grazia Attinasi, M., Bobasu, A. & Manu, A. S. (2021). The implications of savings accumulated during the pandemic for the global economic outlook. *European Central Bank*, *Published as part of the ECB Economic Bulletin, Issue 5/2021.*

-Grigoli, F., Herman, A. & Schmidt-Hebbel, K. (2017). Saving in the world. *Elsevier*.

-Jappelli, T. & Pagano, M. (1998). The Determinants of Saving: Lessons from Italy. *CSEF*.

-Haliassos, M. (2021). *The Pandemic Reset and Its Implications for Household Finances* [Slide show; SUERF]. Savings behaviour in crisis and post-crisis times. SUERF.